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Elevated Pelvis—The Cathe-
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of the Pelvis

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THE DIRECT EXAMINATION OF THE FEMALE
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CATHETERIZATION OF THE URETERS
UNDER DIRECT INSPECTION, WITH
AND WITHOUT ELEVATION OF
THE PELVIS.¹

BY

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(With twenty illustrations.²)

THE efforts of many able men during this century have been directed toward devising a satisfactory instrument for the examination of the inner surface of the bladder, and perchance for the inspection, or possibly even the catheterization, of the ureters. The results of these labors have proven in general far from satisfactory, as we have on one hand the complicated cystoscope of Nitze, of use only to a few specialists, and, on the other, the simpler fenestrated tubes of Grünfeld, yielding at most but meagre results.

The attention of the first workers in this field, even as early

¹ An address delivered at the two hundredth anniversary of the Washington Obstetrical and Gynecological Society.

² I am indebted to my friend Mr. A. S. Murray for the excellent photographs indispensable to a clear demonstration of this subject.

as the fifteenth century, was directed to the removal of stone from the bladder. One of the best and clearest statements of this pioneer work, accompanied with figures of the necessary instruments, is found in the "Surgery" of Peter Dionis.¹ According to Dionis' practice the urethra was first stretched by his "*dilatorium*," after which the delivery of the stone was effected by means of two fingers well oiled and introduced into the vagina, or, in a virgin, into the rectum, while the other hand pressed downward into the pelvis from above, the stone being thus caught between the tips of the fingers and forced into the dilated urethra. When the stone appeared at the external meatus the upper hand was replaced by that of an assistant, enabling the surgeon to deliver the stone with a spoon-shaped instrument. This was called the "minor operation." In the "major operation" of Dionis the external orifice was incised laterally, the urethra dilated, and the stone delivered with forceps.

One of the oldest and most frequently employed methods of dilating the urethra for the exploration of the bladder, and not yet altogether abandoned, consists in boring in succession the little and index fingers into the urethra, following which the bladder is examined directly by touch. Prof. Simon improved these finger methods, which had been so long in vogue, and defined the limit of danger in the dilatation, thus giving the method scientific precision by substituting a definite plan, which he describes in three steps: 1. Incisions into the external orifice of the urethra. 2. Dilatation of the urethra by means of specula plugged with obturators. 3. Bimanual digital palpation of the bladder. He considered the safe limit in the dilatation of the urethra to be two centimetres in diameter, or plus six centimetres in circumference. Beyond this maximum there is imminent risk of incurable urinary incontinence.

To establish certain claims to originality which I shall make, it will be necessary for me first to dwell somewhat in detail upon Simon's work, that I may point out clearly the differences between his and my own methods. In carrying out the first step in Simon's method, the most unyielding part of the canal, the external meatus, is incised in two places, one-quarter of a centimetre in depth anteriorly and one-half centimetre in depth

¹ Heister's German Edition, Augsburg, 1734, pp. 253.

posteriorly. The dilatation is then effected by a series of seven hard-rubber specula with mandarins varying from three-quarters of a centimetre to two centimetres in diameter.

A dilatation of two centimetres is necessary to carry out the next step, the introduction of the index finger into the bladder, by means of which the entire inner surface of the bladder is explored. We can appreciate the practical value of this method by referring to Simon's description of the removal of a vesical polyp, which he accomplished by inserting, upon his index finger, a spoon and pair of forceps into the bladder, by means of which he grasped and removed the polyp. Simon, in speaking of the utility of digital palpation, says: "Every change in form and consistence of the vesical mucosa can be detected by the palpat-ing finger."

As it is important to note precisely his estimate of the value of the endoscope, I quote his remarks as follows: "Endoscopy is also made easier, but the value of this procedure is much less than palpation, as one can never illuminate more than a small area of the bladder, and thus only by chance discover papillary enlargements, ulcers, etc." As to inspection of the ureters he says: "Even with the magnesium light we have endeavored in vain to discover the ureteral orifice. Endoscopy is useful in illuminating all points that have been discovered by touch, and for the illumination of small areas is of great service in the female as well as in the male."

Simon's historical work in the field of ureteral catheterization is well known throughout the world. At the date of his publication (1875) he had succeeded in sounding the ureters seventeen times upon eleven different women. He speaks of its practical utility in the following terms: "As to the assurance of being able to introduce a sound or catheter—in my practice on corpses and the seventeen attempts on the living subject, I have not succeeded in perfecting my method to such an extent that I can feel confident of introducing the sound into the ureter at every sitting, but I believe I could do it in the majority of cases." He further says: "I have had no opportunity to catheterize the ureter in disease."

Grünfeld,¹ one of the ablest followers of Simon in this field,

¹ "Der Harnröhrenspiegel (das Endoscop), seine diagnostische und therapeutische Anwendung," Vienna, 1877.

figures a fenestrated endoscope (page 29), and I quote the following important statement concerning its use: "In the examination of the female urethra or bladder one proceeds best by placing the subject in the same position as for the introduction of the vaginal speculum—that is, on the back, with abducted and flexed thighs. There is no difference in the posture for the examination of the urethra or bladder." To Grünfeld we owe the simpler endoscope, consisting of a metal tube, blackened on its inner surface, and having a plane glass placed obliquely at its vesical extremity. For the purpose of illuminating the interior of the bladder he employs a frontal mirror, to which is attached an electric light. He has also estimated the angle of inclination of the speculum in viewing the ureter at 30° to 35° , as well as the depth necessary to insert the speculum to bring the ureter into view. Catheterization of the ureter is accomplished according to Grünfeld's method by passing a small catheter through the urethra parallel to the endoscope; it is then inclined with the endoscope to the proper angle and engaged in the ureteral orifice; the endoscope is then withdrawn and the catheter pushed further into the ureter.

The present status of cystoscopic work in women cannot be better shown than by quoting our own eminent authority, Dr. Skene,¹ so well known for his original investigations in this field, who says: "The cystoscope of Nitze and Leiter is the only instrument for thoroughly investigating the bladder."

Rutenberg, who considered the ordinary methods of speculum examination either too complicated or inefficient, devised a speculum with a glass partition, and a little tube running down the side of the speculum, to which was attached a rubber ball for inflating the bladder with air. By means of a mirror, attached to a handle, which could be pushed in and out and rotated, the various parts of the bladder wall were inspected. To use this instrument it is necessary to dilate the urethra up to two centimetres in diameter (wanting a half-millimetre), and the patient must be under profound anesthesia. Prof. Winckel,² of Munich, commends this method, stating that he has used it ten times with great satisfaction.

¹ "Treatise on the Diseases of Women," New York, 1889, p. 697.

² Von Billroth and Luecke's "Handbuch," vol. iii., p. 343, Stuttgart, 1886.

Quite recently a brief but suggestive article appeared, written by Dr. Robert T. Morris,¹ in which he clearly indicates one of the lines of progress in this field of work in stating his preference for straight, open specula in the examination of both the male and female bladder.

An excellent, clear résumé of the utility and methods of catheterizing the ureters, from the pen of Dr. Brooks H. Wells,² defines the status of the subject in its most recent developments. From that standpoint I now desire to conduct those who will follow my methods into a new and simpler technique, which will in due time bring investigations of this character within the range of studies of all the students in our medical colleges.

DESCRIPTION OF A NEW METHOD.

None of the methods thus far described can be called either simple or satisfactory for general use. As a consequence of this a direct examination of the female bladder and the local treatment of its diseases, especially of the simpler affections, have been practically abandoned for the past ten years. Such an idea as a simple direct inspection of the bladder and the direct catheterization of the ureters, practicable for all, is not entertained by any one.

It has been my good fortune to work out a simple method which exposes the whole inner surface of the bladder, and the ureteral orifices, to a direct inspection without any intervening fenestra or mirror. By this method any gynecologist, after a little practice, should be able in almost every case to catheterize either ureter within a few seconds after the introduction of the speculum. The bladder exposed in this way may be inspected with as much ease and more directly than the larynx, the posterior nares, or the fundus oculi.

The following instruments and accessories are required for the examination: female catheter; a series of urethral dilators; a series of specula with obturators; common head mirror and a lamp, Argand burner, or electric light; long, delicate mouse-toothed forceps; suction apparatus for completely emptying the bladder; ureteral searcher; ureteral catheter without a

¹ The American Gynecological Journal, July, 1893.

² New York Journal of Gynecology and Obstetrics, 1893, iii., p. 283.

handle; several bran bags or an inclined plane for elevating the pelvis.

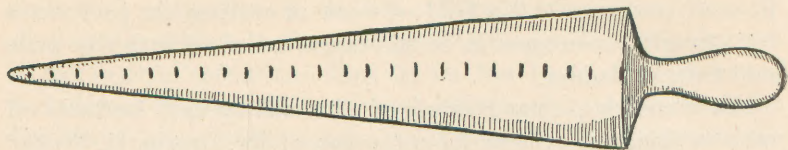
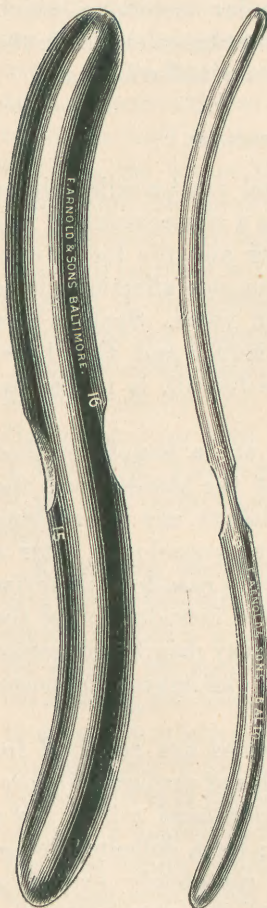


FIG. 1.—Urethral calibrator; short lines indicate diameter in millimetres.

The bladder is first emptied as completely as possible by the catheter. A residuum of from one to several teaspoonfuls of urine always remains, even though the bladder is evacuated with the patient in a standing posture. In order to determine the proper dilator to begin with, I calibrate the meatus urinarius externus by means of a slender metal cone ten centimetres long, marked in a graduated scale from its point, two millimetres, to its upper end, twenty millimetres in diameter (Fig. 1). The calibrator is pushed into the urethra as far as it will readily go, and the marking at the meatus externus noted. A dilator of the diameter indicated by the calibrator is then passed through the urethra by holding the handle at first well above the level of the external meatus, upon which the point rests, and carrying the dilator on through the urethra and into the bladder by a gentle sweeping curve of the hand downward and inward toward the urethra.



FIGS. 2 and 3.—Double urethral dilators. The smaller sizes, Nos. 5 and 6, are only used when calibre of ureter is very small or narrowed by stricture.

By introducing the dilators as they occur in the series, the average female urethra can easily be dilated up to twelve millimetres in diameter with only a slight external rupture. I have never seen a tear more than two or three millimetres in length and from one to one and a half in depth. I

have as yet had no occasion to incise the meatus to avoid extensive rupture.

The metal dilators which I use for this purpose are double-ended and of a flattened S-shape, each end representing a single dilator in the series. The points are conical. A flattened area



FIG. 4.—Hips in *moderate* elevation for cystoscopic examination and direct catheterization of ureters. Cystoscopic and ureteral instruments on tray in foreground.

in the middle, upon which the diameters of the dilators are marked, affords a convenient grasp. The series begins with No. 5 and runs in pairs up to No. 20; thus Nos. 5 and 6, 7 and 8 are made of one piece of metal, and so on through the series (Figs. 2 and 3). The calibre of both dilators and specula is marked in millimetres.

As soon as a dilatation of from twelve to fifteen millimetres is reached a speculum of the same diameter as the last dilator is introduced and its obturator removed.

The *hips of the patient are now elevated* on the cushions, or on a short inclined plane, twenty to thirty, or even forty, centimetres (eight to twelve or sixteen inches) above the level of the table (Figs. 4 and 5).

There are sixteen specula (Figs. 6 and 7), varying from five to

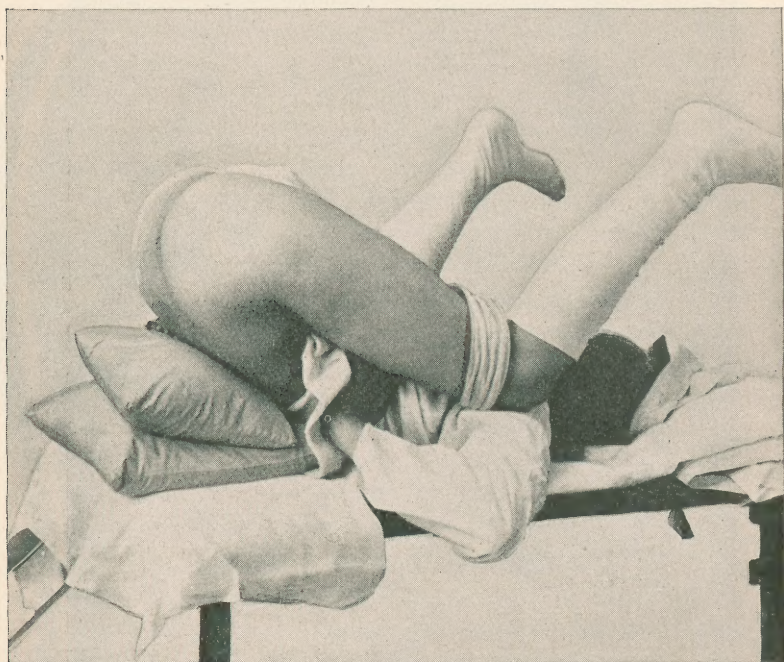


FIG. 5.—Hips in *extreme* elevation for cystoscopic examination and direct catheterization of ureters.

twenty millimetres in diameter, the successive sizes increasing by one millimetre. The specula are cylindrical, nine and a half centimetres long, and each is provided with a conical mouth to assist in reflecting the light into the bladder. Each speculum is fitted with an obturator (Fig. 8). The calibre is marked in millimetres on a little handle at the side of the speculum.

The examiner now puts on the head mirror and prepares to inspect the bladder. An electric drop light, an Argand burner, a lamp, or a candle in a dark room, is held close to the patient's

symphysis pubis so that the light can be easily caught by the head mirror and reflected into the bladder. A good direct light from a window will also suffice.

Upon withdrawing the obturator, the pelvis being elevated, the bladder becomes distended with air, and by properly directing the reflected light all parts of its interior are accessible to a direct inspection (Fig. 9).

If a pool of urine remains in the bladder it should be withdrawn by means of a simple suction apparatus (Fig. 10). If there is a residuum of not more than two or three cubic centimetres, it can easily be removed by little balls of absorbent cotton

grasped with long, delicate mouse-toothed forceps, the teeth of which are slightly recurved (Fig. 11). The facility with which foreign bodies are removed from the bladder by this method can be demonstrated by dropping a pledget of cotton into the bladder—it can be seen with the utmost ease, picked up, and removed without difficulty.

The posterior wall of the air-distended bladder lies two to five centimetres distant from the anterior wall, and over this white background, which first presents itself to the eye of the observer, is visible a beautiful network of branching and anastomosing vessels. The veins accompanying the arteries are easily distinguished by their dark color. The larger vessels evidently come to the surface from the deeper layers of the bladder, when they branch stellately, divide, and anastomose.

By elevating the handle of the speculum the field of vision sweeps over the base of the bladder until in some cases the region of the interureteric ligament comes into view, often marked by a slightly elevated transverse fold or a distinct difference in color. By turning the speculum thirty degrees to one side or the other and looking sharply, a ureteral orifice is discovered (Fig. 12). While inspecting the

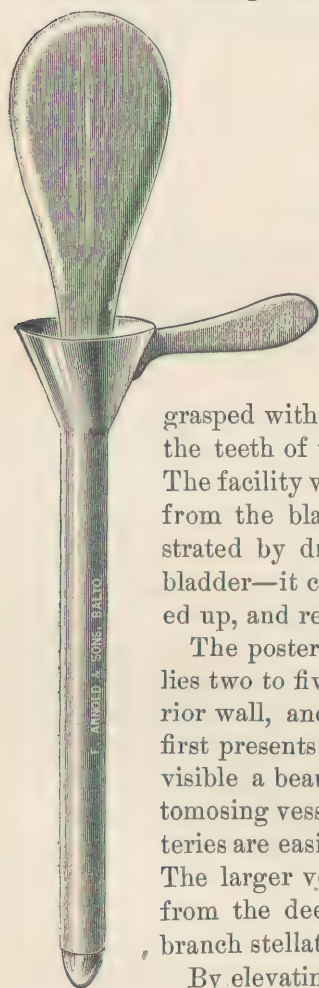


FIG. 6.—No. 6 speculum (natural size). This size is used when urethra is very small or in inspecting the bladder in children.

ureter I have frequently observed little jets of urine ejected at short intervals, like a miniature fountain; in pathological cases

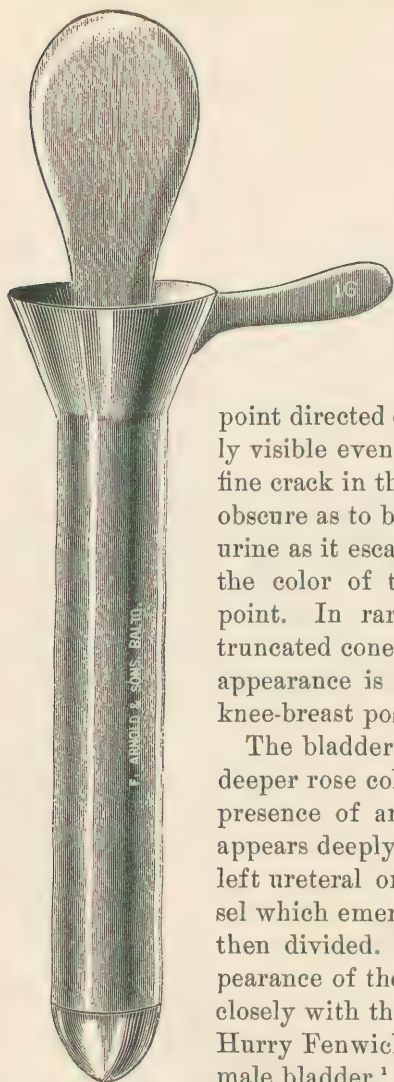
I have seen pus and blood flowing from one ureter while the other discharged normal urine.

The ureteral orifices and their surroundings are not constant in appearance. Sometimes the orifice appears as a dimple or a little pit, or, in inflammatory cases, as a round hole in a cushioned eminence; at other times as a \wedge with the

point directed outward; again it may be scarcely visible even to a trained eye, appearing as a fine crack in the mucosa, and occasionally is so obscure as to be recognized only by the jet of urine as it escapes, or by a slight difference in the color of the mucous membrane at that point. In rare cases it has the form of a truncated cone with gently sloping sides; this appearance is most apt to be developed in the knee-breast position.

The bladder mucosa is usually of a slightly deeper rose color around the ureter, and in the presence of an inflammatory process it even appears deeply injected. In one instance the left ureteral orifice was marked by a large vessel which emerged directly from its lumen and then divided. My observations upon the appearance of the female ureteral orifice coincide closely with the clear description given by E. Hurry Fenwick, of London, in his work on the male bladder.¹

FIG. 7.—No. 16 speculum (natural size). This speculum is usually the maximum size used in cystoscopy or catheterization of ureters.



In the direct inspection the ureteral orifice always appears to lie nearer the urethra than one would anticipate. This is a result of the illusion produced by the foreshortening of the base of the bladder; the foreshortening also accounts for the difficulty in finding the orifice immediately in

¹ British Medical Journal, June 16th, 1888.

those cases in which it appears as a mere slit in the vesical mucosa. Quite the contrary is true in the free-hand catheterization of the ureter by Pawlik's method.

A valuable aid for the beginner searching for the ureteral orifice is

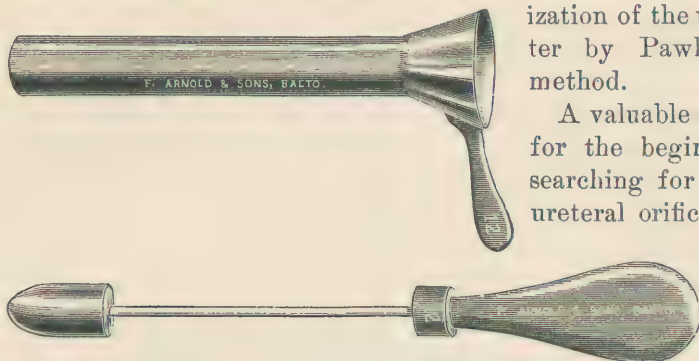


FIG. 8.—Speculum and obturator (two-thirds natural size).

the following: A point is marked on the cystoscope five and a half centimetres from the vesical end, and from this point



FIG. 9.—Direct inspection of bladder by reflected light; electric bulb with reflector held above symphysis pubis; hips in moderate elevation.

two diverging lines are drawn toward the handle with an angle of sixty degrees between them (Fig. 13). The speculum is

introduced up to the point of the V, and turned to right or left until one side of the V is in line with the axis of the body; then by elevating the endoscope until it touches the floor of the bladder the ureteral orifice will usually be found within the area covered by the orifice of the speculum. The ureteral orifice can often be found by an adept at once, and almost instinctively, by a single movement of the speculum after its introduction into the bladder.

In order to ascertain whether it is the ureter which lies within the field, I use as a searcher (Fig. 14) a long, delicate sound with a handle bent at an angle of 120° , which is introduced through the speculum into the suspected

ureteral orifice (Fig. 15). If it be the ureteral orifice which is under inspection, the searcher passes easily from two to six centimetres up the

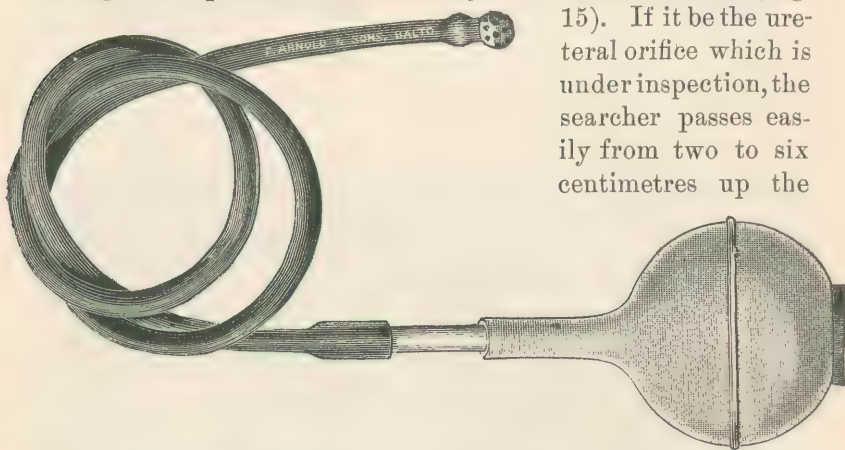


FIG. 10.—Suction apparatus (three-fourths natural size) used for withdrawing residual urine.

ureter, and the lateral walls of the orifice are slightly raised, appearing as distinct folds with a dark pit between them. The searcher may be withdrawn and a ureteral catheter at once introduced, if it is desirable to collect the urine direct from the kidney. The ureteral catheters which I use for direct catheterization are quite different from those heretofore employed. They are straighter, and either have no handle or only a small one which will readily pass through the No. 10 speculum (Figs. 16, 17, 18). The catheter may be left in place some minutes or an hour or more. The urine which accumulates in the meantime in the bladder necessarily represents the discharge of the opposite kidney; in this way the urine of both kidneys may be isolated by simply introducing one catheter.

By placing the patient in the genu-facial posture (Fig. 19) an

extreme distention of the bladder is obtained in the form of a flattened ovoid. In this posture the interureteric ligament also comes sharply into view, but the ureters are not so readily seen, as they are concealed by the outer extremities of the fold. The genu-facial posture is indispensable in some inflammatory cases when the bladder will not balloon out in the ordinary posture owing to its thickened walls. A satisfactory inspection can also be made in many cases in the left semi-prone position by elevating the pelvis on a pillow.

Simple Direct Catheterization without Elevation.

—After some practice it is possible even to catheterize the ureters with the patient simply in the dorsal position without elevation of the pelvis. The success of such an attempt depends upon the examiner's familiarity with the position and appearance of the ureteral orifice on the posterior wall of the bladder. The manipulation necessary to expose the ureteral orifice becomes with practice almost instinctive. The bladder is emptied by catheter, the ureter is dilated, and the speculum, No. 10 or 12, introduced from five and a half to six centimetres, and its outer end elevated until the base of the bladder appears, when it is turned thirty degrees to the right or left, and with a little patience in searching the ureteral orifice is found. To prevent the residual urine from obscuring the field the speculum is gently pressed against the mucous membrane; it is then only necessary to take up the urine with pledgets of cotton as it flows from the ureter into the speculum.

An anesthetic is not necessary for cystoscopy or catheterization of the ureters, unless the urethra is to be dilated up to No. 14, 15, or 16. In nervous women it is often best to make a thorough examination first under anesthesia. Subsequently a satisfactory illumination of the bladder can be made, and the ureters catheterized and any ordinary treatment readily applied through the No. 10 speculum without anesthesia. I have succeeded



FIG. 11. — Delicate mouse-toothed forceps (three-fourths natural size).

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repeatedly in passing the No. 12 speculum in nervous women



FIG. 12.—Speculum inclined 30° to left, exposing right ureter, searcher being introduced.
without causing marked discomfort. Anesthesia will be em-

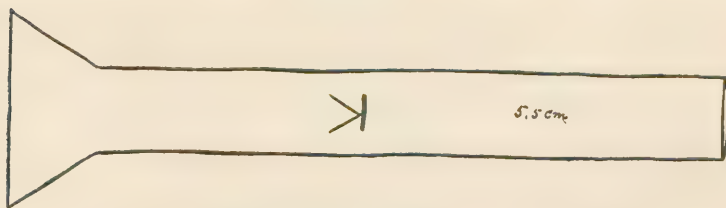


FIG. 13.—Speculum marked for finding ureter automatically.

ployed less frequently as the examiner gains skill and confidence

in manipulating the instruments. A pledget of cotton saturated with a five-per-cent cocaine solution, inserted into the urethra seven minutes beforehand, greatly facilitates the dilatation and is often the best form of anesthesia.

Four specula, Nos. 8, 10, 12, and 14, and dilators Nos. 7 and 8, 9 and 10, 11 and 12, 13 and 14, 15 and 16, mouse-toothed forceps, aluminum applicator, ureteral searcher, and one ureteral catheter are practically the only instruments required for general purposes of diagnosis and treatment.



FIG. 14.

FIG. 15.

FIG. 14.—Ureteral searcher.

FIG. 15.—Left ureteral orifice exposed and searcher engaged.

A wide field is opened to the gynecologist by these simple means of diagnosis and treatment. It is an enormous stride forward to be able to expose all parts of the bladder walls so

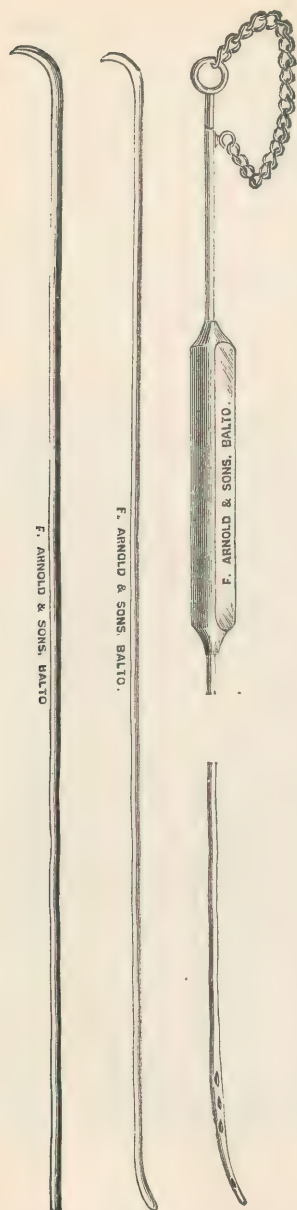


FIG. 16. FIG. 17. FIG. 18.

FIGS. 16 and 17.—Ureteral catheters without handles, for direct catheterization through speculum.

FIG. 18.—Ureteral catheter with handle sufficiently reduced to allow speculum to be withdrawn after catheter is engaged in ureteral orifice.

that they can be seen with ease and without other aid than a simple open speculum and a suitable posture.

It becomes a duty to examine at once all bladder affections which are more than trifling, to disclose the exact nature and the extent of the disease. Frequently the examiner will be astonished by discoveries which will relegate one by one a large number of functional affections to the domain of positive demonstrable diseases.

To generalize from the cases lately under my care, I am able to say that cystitis is often a localized disease limited to a special area of the bladder. Tubercular and ulcerative cystitis can be detected at once. Tumors, calculi, and fistulæ are readily found, particularly with the patient in the genu-facial posture. Cicatrices stand out in sharp relief. Cases usually called irritable bladder show definite areas of hyperemia surrounding and between the ureteral orifices. In a case of incontinence recently under my care I found an extreme injection of the mucosa over the interureteric ligament.

I have a patient now under observation in whom the ordinary means of diagnosis had been employed by several able practitioners without revealing the source of a persistent pyuria. A microscopic examination of the urine showed that it contained tubercle bacilli. On cystoscopic examination the bladder was found to be inflamed at its base, with several red, papillary projections in the right

inferior quadrant of the posterior hemisphere. In front of this papillary mass there were about twelve tubercles, the rest of the bladder appearing normal. Both ureteral orifices discharged clear urine. A small quantity of pus exuded from the papilloma during the examination, and on probing it with the searcher a sinus was discovered leading back of the uterus into a tuberculous ovary or tube on the right side. On placing the patient in



FIG. 19.—Cystoscopy in genu-facial posture; speculum introduced into bladder; dilator under right thumb indicates position of anus.

the knee-face position the rest of the bladder ballooned out, while the drawn, puckered appearance about the fistula stood out in strong contrast, indicating clearly the focus of disease.

In hysterectomy for carcinoma of the cervix, and in some hysteromyomectomies, it is of the utmost importance to know throughout the operation the exact location of the ureters, to avoid tying or cutting them. I have recently overcome this

difficulty in a case of cancerous uterus by the following device: The right ureter was exposed under a No. 12 speculum without elevating the hips, and a bougie, one and a half millimeters in diameter and twenty-five millimetres long, was engaged in the ureter and pushed up over the pelvic brim toward the kidney until only three or four centimetres of its length remained outside the meatus (Fig. 20). The speculum was then withdrawn and reintroduced alongside the bougie, and the opposite ureteral orifice exposed and a similar bougie introduced. The abdomen was then opened, and the ureters were distinctly felt



FIG 20 —Hard-rubber bougies introduced into both ureters previous to hysterectomy for carcinoma.

like hard cords throughout the operation. A point of great practical importance was that the bougies served to keep the ureters pressed down against the pelvic wall away from the uterus. With this assistance the broad ligaments were rapidly tied off without fear of including a ureter.

Treatment is greatly facilitated, as direct applications to localized areas can be made with the same ease as upon the exterior of the body. In view of this improvement it can no longer be deemed right to inject strong solutions or escharotics into the bladder, which affect equally its entire inner surface when the disease is limited to a definite area. Forceps, snares,

tenacula, knives, and instruments for measurement can be readily used through the larger specula, from No. 12 up.

I have recently had the pleasure of demonstrating, in my clinic at the Johns Hopkins Hospital, these methods of examination and treatment of diseases of the bladder and the catheterization of the ureters under direct inspection, to a large number of physicians from all parts of the United States, as well as to my friends Prof. Winckel of Munich, and Prof. Pozzi of Paris. I have also given a demonstration at the Kensington Hospital for Women in Philadelphia before a number of gynecologists especially invited by Dr. C. P. Noble, as well as in the presence of the Johns Hopkins Hospital Medical Society.

[NOTE.—The instruments have all been made by Mr. Arnold, of Baltimore, who, at my special request, has not stamped his name upon them. He has also, at my request, submitted all instruments to me for inspection before sending them away.]

